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Memoirs of the Department of Agriculture in India

LIFE-HISTORIES OF INDIAN INSECTS
MICROLEPIDOPTERA

BY

T. BAINBRIGGE FLETCHER, R.N., F.L.S., F.E.S., F.Z.S

Imperial Entomologist

AGRICULTURAL RESEARCH INSTITUTE, PUSA

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November, 1920 ENTOMOLOGICAL SERIES VOL. VI, No. 1

MEMOIRS OF THE DEPARTMENT OF AGRICULTURE IN INDIA

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I. PTEROPHORIDÆ

BY

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PREFACE

The term "Microlepidoptera" is commonly and loosely applied to the (usually small) moths belonging to the groups Pterophorina, Tortricina, Tineina and Micropterygina. Strictly speaking, many comparatively large moths of the families Cossidæ, Ægeriadæ, Hepialidæ, etc., should be included amongst the "Micros," numerous species of which, by the way, are considerably larger than many Macros, but, as Mr. Meyrick has recently remarked, some families of the true Microlepidoptera are commonly appropriated by the collectors of the larger Lepidoptera without any justification. For the purpose of these papers the term Microlepidoptera is taken to include those families which are not included in the volumes on Moths in the *Fauna of British India* series.

It is only within the last fifteen years that any serious attempt has been made to acquire a knowledge of the Microlepidoptera of the Indian Region. In 1889, at the time of the publication of Cotes' and Swinhoe's *Catalogue of the Moths of India*, only 225 species of Microlepidoptera were enumerated and this number included several synonyms and species which are not true "Micros." At the present time 2,422 species, contained in about 458 genera, have been recorded and we are still only beginning to learn what forms actually exist within the Indian Empire, in which enormous areas are still absolutely unknown so far as concerns their microlepidopterous fauna.

Our knowledge of the early stages of these little moths is still more incomplete, although numerous species are of considerable importance as pests of crops or of household or stored products. The Pink Bollworm (*Platyedra gossypiella*) and the Potato Moth (*Phthorimœa operculella*), for example, do damage which totals

many millions of rupees annually, whilst every household in India suffers loss on account of the Grain Moth (*Sitotroga cerealella*), and what housewife, be she never so careful, but has found reason to bewail the damage caused by Clothes Moths (*Tinea pellionella, Trichophaga abruptella*, etc.) ?

The present and subsequent papers endeavour to indicate our present state of knowledge (I might almost better say our want of knowledge) of the life-histories of these small moths, so far as they are at present known in India, and some indications are given of the early stages of three hundred and ninety-six species, the information given being based upon records already published in various sources and on unpublished records derived from the files of the Entomological Section of the Pusa Research Institute. The scattered manner in which these records have been published hitherto is indicated by the references given under each species and it is hopeless to expect the ordinary worker in India, without a veritable library specially gathered to this end, to be able to consult all these references at first-hand. I have therefore considered it better to bring together all the published information, even at the risk of a certain amount of repetition.

It is hoped that these papers will be of use, not only to the Entomological Staffs of the Agricultural Department who are interested primarily in crop-pests, but also to those collectors in India who ordinarily occupy themselves only with the butterflies and larger moths, mainly because of the scanty available information regarding the smaller forms.

It should be emphasized that these papers deal only with life-histories and not with control measures, in the case of pests or with classification. Both of these aspects may perhaps be treated of hereafter.

PUSA:
25th June, 1919.

T. BAINBRIGGE FLETCHER,
Imperial Entomologist.

LIFE-HISTORIES OF INDIAN INSECTS MICROLEPIDOPTERA.

I. PTEROPHORIDÆ.

BY

T. BAINBRIGGE FLETCHER, R.N., F.L.S., F.E.S., F.Z.S.,

Imperial Entomologist.

[Received for publication on 27th June, 1919.]

DIACROTRICHA FASCIOLA, ZELL.

Diacrotricha fasciola, Zeller, Linn. Ent., VI, 399 (1852) (1); Meyr., T. E. S. 1907, 471 (1908) (2); Fletcher, Spolia Zeylan., VI, 31-32, t. A f. 6, t. F ff. 5, 6, 8 (3).

Diacrotricha callimeres (Meyr., *ined.*), Lefroy, Ind. Ins. Life, p. 528 (1909) (4).

ORIGINALLY described from Java (1), this species is known to occur in India (2—4), Ceylon (2, 3) and the Kei Islands (New Guinea) (2). We have it from Galle (Ceylon), Gauhati and Pusa. It is probably widely distributed in India but has been overlooked.

"Bred by Mr. H. Maxwell-Lefroy from pupæ found on leaf of *Averrhoa bilimbi?*, a tree of cultivation, so that it may be artificially spread" (2). These specimens were bred at Pusa from *Averrhoa carambola.*

"The short, stout, uniformly-coloured larva feeds on the flowers of the 'bilimbi tree' (*Averrhoa bilimbi*). The larvæ vary much in colour, hardly two being alike. Uniform yellowish-grey, pale yellow, pale greenish-yellow, pale green, pale pink, and red, are all common colours. (Plate F, figures 5 and 6)" (3). The young larva bores into flowers of *A. carambola* at Pusa, the hole of entry being visible on the side of the unexpanded flower.

"The pupa is a very pretty object, being usually a bright light green (sometimes with black markings) with numerous fasciculated tufts of yellow spiny hairs. The sketch (Plate F, figure 8) .... gives a good idea of its general

appearance. It is generally attached to a flower-stalk, but sometimes to a flower-petal or fruit, or more rarely a leaf, of the foodplant" (3).

"The transformations of this species are unusually rapid, the larva suspending itself and pupating in a few hours, the imago emerging after a pupal period of only four or five days" (3).

BUCKLERIA PALUDICOLA, FLETCHER.

Trichoptilus paludicola, Fletcher, Spolia Zeylan., V, 20-32, 7 figures (1907) (1) *l.c.* VI, 31, t. A f. 7 (1910) (2).

This species was originally described from Diyatalawa (Ceylon) (1) and has also been recorded from Madulsima (2) and the Khasi Hills (1). It is probably widely distributed in India in localities where *Drosera* grows but is inconspicuous and easily overlooked. We have it from Diyatalawa and Kegalle in Ceylon, and from Shillong.

At Diyatalawa the larva was found to feed on *Drosera burmanni*, which is of common occurrence in India also.

"*Egg-laying.* A female moth confined over plants of *Drosera burmanni* laid several ova, most of which were deposited on the seed capsules and unexpanded flower-buds. One ovum was laid midway on a petiole on the edge of a young leaf.

"*Ovum.* When first deposited the egg is of a pale shining green colour, showing prismatic tints. There seems to be a system of rather coarse reticulation disposed regularly over the surface, but the enclosed depressions are very shallow. It is oval in longitudinal, circular in transverse, section. Its length is about 0·45 mm. and its diameter about 0·18 mm.

"*Larva.* There are apparently four instars :—

"*First instar.* The newly-hatched larva is about 1 mm. long. In colour it is a pale transparent yellow which takes a reflected tint from the *Drosera* leaves, thus making the young larva very difficult to see ; the prothoracic segment is a little darker, and the head is brown and comparatively very large. Scattered over the body are short white hairs, but they are neither conspicuous nor plentiful. No warts are visible.

"The larva crawls about without hesitation amongst the glandular hairs of the *Drosera* leaf, the gummy tips of the petioles standing up above it, so that it can walk about among their bases with impunity. In this stage it seems to feed entirely on the petioles and gum.

"Before undergoing its first ecdysis the larva grows to about 1·5 mm. in length, and the segmental interstices are more plainly marked in a lighter

yellowish colour, whereas the segments themselves have become of a darker greenish-yellow.

" *Second instar.* About 2 mm. long and rather stout. Colour a greenish-yellow, paler below and on the sides on which the spiracles stand out darkly ; there are apparently small latero-dorsal tubercles which bear rather long white clubbed hairs.

" If feeds on the glandular petioles, biting through the base and drawing the stalk into its mouth by a series of movements and finishing by devouring the drop of gum. It seems fairly voracious, but is evidently rather fastidious in its selection of the glandular hairs.

" *Third (? antepenultimate) instar.* About 3 mm. long and fairly stout. Colour a pale green with interrupted pinkish latero-dorsal, lateral and supra-spiracular stripes. Tubercles green at base, brownish at points of emission of the white hairs . . . . . .

" *Fourth (ultimate) instar.* A fully-fed larva on the point of pupation is just over 7 mm. long, moderately stout, stoutest about middle of body, tapering rather more rapidly towards the head. Colour pale green, a dark rather reddish narrow medio-dorsal stripe ; latero-dorsal tubercles red and surrounded with dark red dashes, which assume a rather longitudinal direction, so that the larva seems to have an interrupted rather broad latero-dorsal stripe. Head pale green with dark ocellar marks on either side. Jaws and mouth-parts reddish. Long palps on either side of jaws.

" The larvæ, however, vary much, but seem divisible into three types :—

" (1) Pale green with a distinctly reddish tinge ; a narrow darker green dorsal stripe bordered on either side by a pale yellowish longitudinal line ; head pale green with dark reddish ocellar patches ; tubercles reddish-brown ; hairs white, as long as diameter of segmental interstices, slightly and regularly dilated towards apex ; prolegs pale green, almost transparent.

" (2) Paler green, on which the tubercles show up conspicuously as a bright dark red.

" (3) Very much suffused with red, so as to appear of almost as red a colour as the *Drosera* itself.

" The intensity of the dorsal stripe is very variable ; in some specimens it is very distinct, in others quite obsolete.

" In its final instar the larva shows a decided preference for the buds and seeds of the *Drosera*, eating a hole in the side of the seed capsule and devouring the contents, but it also eats the leaves.

" *General remarks on the larval state.* In all its stages the larva is extremely similar to the *Drosera* and difficult to distinguish. Even a full-grown larva

may easily be passed over as a glandular leaf seen edgewise, and *vice versâ*.

"Ordinarily the larva seems sluggish, but can move along fairly fast when it likes. It has, indeed, little incentive to move from the foodplant. When resting across the centre of the plant, with plenty of food within reach, it seems to remain there for days, until a large pile of flaccid dark yellowish-green frass accumulates.

"In some cases the frass is jerked away by a rapid movement of the anal extremity. In one instance which I noted it went about an inch up into the air and fell on to the *Drosera* plant about half an inch away from the larva; but usually, I should imagine, it falls clear of the foodplant, or there would be no object in flicking it away in this manner. However, as noted above, the frass often does accumulate on the foodplant, so evidently this process of removal is not an invariable habit, but is a peculiarity confined to certain individuals.

"When crawling onto a *Drosera* plant the larva seems very careful to keep clear of the gummy detioles, and is assisted to do so by its long hairs, more especially those situated upon the head, for these hairs are seen to have enlarged basal attachments, which are evidently correlated with hypertrophied tactile nerves.

"When crawling over the leaves the gum is often seen to adhere to the legs of the larva, which then stops, bends down its head, and cleans them by passing the gummy legs through its mouth. The whole process rather reminds one of a cat licking itself clean.

"*Pupation.* When searching for the larvæ I must have examined several scores of *Drosera* plants, which either contained full-fed larvæ or showed signs of having recently done so, but only in one case have I as yet found the pupa in a natural position, and, judging by the restless behaviour of larvæ in confinement just prior to pupation, I am constrained to believe that the larva wanders away from the plant and fixes itself up for pupation on some grass stem or similar object, where its discovery would be rendered exceedingly difficult by its resemblance to a pendulous grass seed.

"This pupa, which was found *in situ* in its natural position (on 27th August) was on a medium-sized *Drosera* plant, which was growing under the shade of a tuft of grass. The plant had evidently been badly eaten by the larva, and there was no flower-stalk. The pupa was attached by its cremastral hooks to a silken pad spun on the base of a leaf just below the central bud and was lying, dorsal surface uppermost, across some leaves whose gummy

petioles had been eaten away by the larva. This pupa was of a greenish-yellow-brown colour, just the tint of the faded sundew leaves, and it looked rather like a grass seed which had fallen on to the plant and stuck to the gum; it may be added that ripe grass seeds are often so found.

"In confinement the larva exhibits a certain preference for suspension from the flower-stalk of its foodplant, whose colour is of a reddish green. Even when the stem is growing at an angle, its double set of cremastral hooks enables the pupa to keep its ventral surface closely appressed to the lower side of the stem, so that it is not suspended freely. It seems possible that this pupa possesses a certain amount of colour adaptability, those pupæ attached to the reddish flower-stems having usually an increased red suffusion in comparison with those attached to glass or white paper.

"When on an approximately horizontal surface, the pupa is usually found dorsum uppermost; otherwise it invariably suspends itself head downwards and with the ventral surface appressed to its support.

"In the case of a pupa in a horizontal position the cast larval skin is sometimes seen lying near it, but quite free and shrivelled up. The suspended pupa always gets rid of the larval skin entirely. This habit is the exact opposite of that found in *Trichoptilus oxydactylus* [*Buckleria defectalis*], whose discarded larval skin is not shrivelled up, but is stretched out along the stem just above the pupa.

"When first formed the pupa is of a light apple-green colour, the wing-covers and appendages of a darker green, and a narrow darker medio-dorsal stripe. On either side of this last is a series of eight red tubercles, each bearing two black spines, both pointing longitudinally in opposite directions; on about the eighth somite, however, the foremost of these two spines becomes obsolescent and quite disappears before the anal extremity is reached. The cremaster consists of two portions approximately equal to one another, one in the centre of the ventral surface of the twelfth somite, the other at the anal extremity.

"In some cases the newly-formed pupa is wholly suffused with a delicate pink flush, which almost becomes a dull red in some specimens.

"After a couple of days the bright green begins to fade and ultimately becomes a dull uniform pale yellowish-brown, by which time the eyes and antennæ are clearly marked in black.

"The pupa is formed about thirty hours after the larva has suspended itself, and the moth emerges after about nine or ten days in the pupal state.

"The moth always emerges in the morning, usually at about 8 A.M" (1).....

BUCKLERIA XERODES, MEYR.

Trichoptilus xerodes, Meyr., T. E. S., 1886, 14 (1), *l.c.* 1885, 422 (2), *l.c.* 1887, 267 (3), B. J., XVII, 134 (1906) (4); Fletcher, Spolia Zeylan., VI, 30, t. A f. 9, t. F f. 4 (1909) (5); Meyr., Gen. Ins. Pteroph., p. 5, tab. f 2 (1910) (6).

This species is widely distributed throughout Australia (1—3) and has also been recorded from New Guinea(6) and Ceylon(5). We have it from Nagpur, where it was reared by Ratiram Khamparia on 22nd November, 1912, from a larva found on pods of *Cajanus indicus*, from Khurda, Pollibetta (Coorg), and from Trincomali and Haldummulla in Ceylon.

A larva found at Peradeniya on 26th December, 1907, on *Gynandropsis* sp. (Capparideæ) was described as "about 12 mm. long, cylindrical, moderately stout. Head yellowish with an orange tinge. Colour of other segments a uniform pale yellow. A large brown latero-dorsal wart emits a long white hair and about five short ones. Below this is a small black supraspiracular tubercle emitting a single short white hair and bearing a short secondary hair. Spiracle small, black. A small black subspiracular tubercle emits (1) a short white hair directed forwards and downwards, (2) a longer white hair directed backwards and downwards. Below this and a little behind it is a small black wart emitting a single hair. Towards the ventral surface are two (? three) small black warts emitting white hairs. There are numerous small knobbed white secondary hairs. All warts are well raised above the surface of the skin, and the divisions of the segments are well marked. (Plate F, figure 4)."(5) This larva was not reared and at the time was only supposed to be *B. xerodes* but later on Mr. Green informed me that he had bred this species from similar larvæ on this foodplant.

BUCKLERIA DEFECTALIS, WLK. (PLATE I, FIG. 1.)

Pterophorus defectalis, Wlk., Cat. XXX, 943 (1864)(1).
Pterophorus congrualis, Wlk., Cat. XXX, 943 (1864)(2).
Pterophorus oxydactylus, Wlk., Cat. XXX, 944 (1864)(3).
Trichoptilus ochrodactylus, Fish, Canad. Ent. XIII, 142 (1881)(4); Fernald, Pteroph. N. Amer., 2nd edit., p. 15 (1898)(5).
Trichoptilus compsochares, Meyr., T. E. S., 1886, 16 (1886)(6).
Trichoptilus centetes, Meyr., T. E. S., 1886, 16-17 (1886)(7), *id.*, *l.c.* 1887, 266 (1887)(8); Wlsm., P. Z. S., 1891, 494(9), *id.*, *l.c.* (1897), 56(10).
Trichoptilus ralumensis, Pag., Zoologica, XXIX, 239(11).
Aciptilia oxydactyla, Wlsm. P. Z. S., 1885, 885(12), Moore, Lep. Ceylon, III, 529, t. 209, f. 16(13).

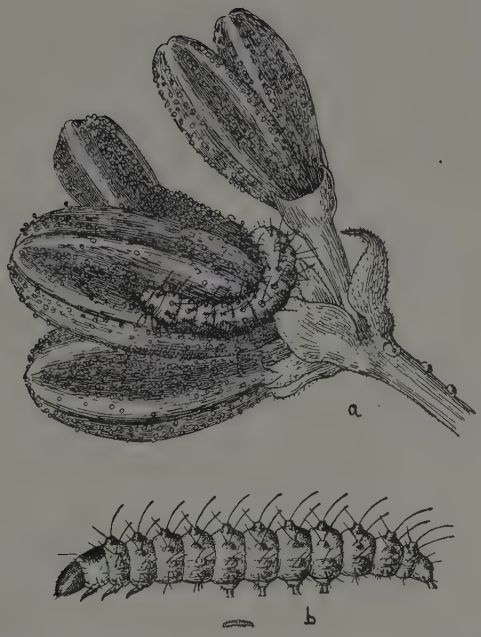


Fig. 1. *Buckleria defectalis*:—*a*, Larva feeding on fruits of *Boerhaavia repens* (x 10); *b*, larva, about half-grown, natural size and magnified (x 13).

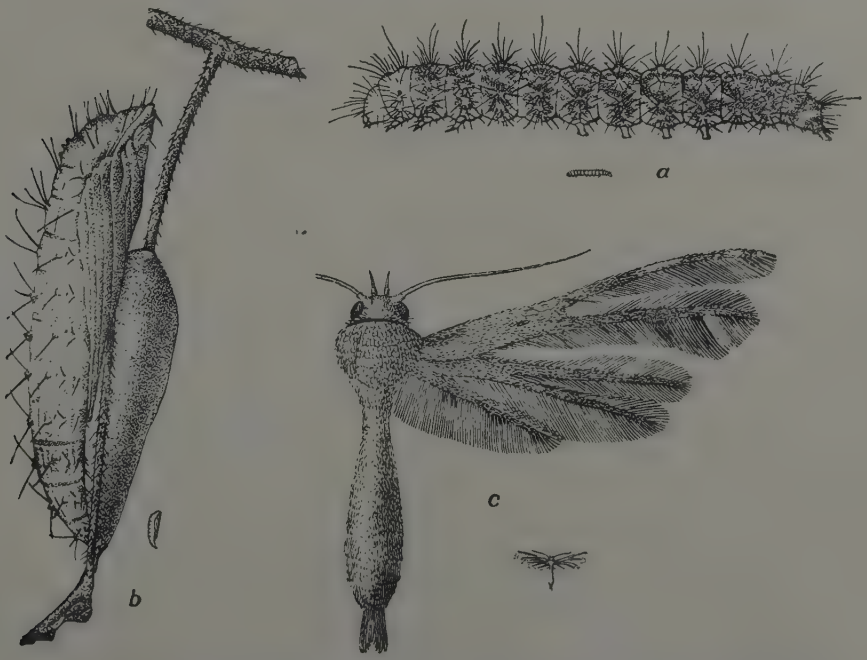


Fig. 2 *Buckleria wahlbergi*:—*a*, Larva; *b*, pupa; and *c*, moth, natural sizes and magnified (x 11).

Trichoptilus congrualis, Fletcher, Spolia Zeylan., VI, 28-30, t. A f. 8, t. F ff. 2, 3 (1909)([14]).

Trichoptilus defectalis, Fletcher, T. L. S. (2) XIII, 312 (1909)([15]).

Buckleria defectalis, Fletcher, T. L. S. (2) XIII, 398-399 (1910)([16]).

Originally described from West Africa([1]) and Ceylon ([2, 3]), this is an extremely widely distributed species, recorded from the Southern United States, West Indies, Peru, West, South and East Africa, Mauritius, Farquhar Island, Amirantes, Coetivy, Seychelles, Chagos Islands, Ceylon, India, Formosa, China, New Guinea, North-East Australia and Hawaii([16]).

In India and Ceylon this seems to be a Plains species, found abundantly in all sandy areas where its foodplant, *Boerhaavia*, occurs. We have specimens from Trincomali, Colombo, Coimbatore, Pusa, Chapra, Bassein Fort (Bombay), Lyallpur, Peshawar, and Hangu (Kurram Valley).

The following description was made from a larva found at Galle on 10th May, 1907 :—"The larva has just cast its skin (which remains alongside it, uneaten) and is probably just commencing its final instar. Length 5·5 mm. Breadth in thickest part (about middle) 1·5 mm. Hairs about 1 mm. long. In shape it is cylindrical, moderately stout, tapering at either extremity. When crawling, the thoracic segments, especially the prothoracic, are greatly extended and appear very slender and flattened. The head appears to be uniformly jetty-black, but under a high-power lens the central portion and jaws are seen to be yellowish with a few short yellowish hairs. The ground-colour along the side is a pale yellowish shade of dirty grey with a tinge of red (this last colour is more pronounced in some specimens). There is a narrow medio-dorsal stripe of a shade rather darker than the ground-colour and a little redder. On the metathoracic segment the two warts edging the medio-dorsal line are faintly marked with dark reddish-fuscous ; the four succeeding segments have these warts distinctly marked with the same dark reddish-fuscous, and therefore show up like spots. (In other larvæ all the dorsal warts are more or less marked with dark fuscous, shading off at either extremity of the larva.) A broad but indistinct fuscous subspiracular line. A rather broad ventral pale-greenish stripe. The prolegs are very long and slender and are of a pale greyish greenish-yellow, the hooks dark ; the legs are similarly coloured. The long hairs appear dark but there are numerous minute white knobbed glandular secondary hairs scattered over the segments, and these appear to secrete a viscous fluid "([14]).

Two full-fed larvæ found at Colombo on 18th October, 1907, were described as "stout, stoutest about fourth segment, decreasing thence rapidly towards the head, anally gradually. Colour a pale yellow with a faint tinge of fuscous

green. There is a broad dull reddish longitudinal spiracular stripe, on which the spiracles stand out as pale longitudinal blotches. The medio-dorsal stripe has a faint tinge of red in it, making it a little darker than the ground-colour. On either side of this, bordering the darker brown latero-dorsal tubercles, is a series of whitish longitudinal dashes, forming two interrupted dorsal lines—these markings absent in one larva. Head dark brown. The long hairs are black and obviously sticky. A younger larva, about half-grown, is dark brown without any obvious markings, the hairs very distinctly clubbed at the apex."

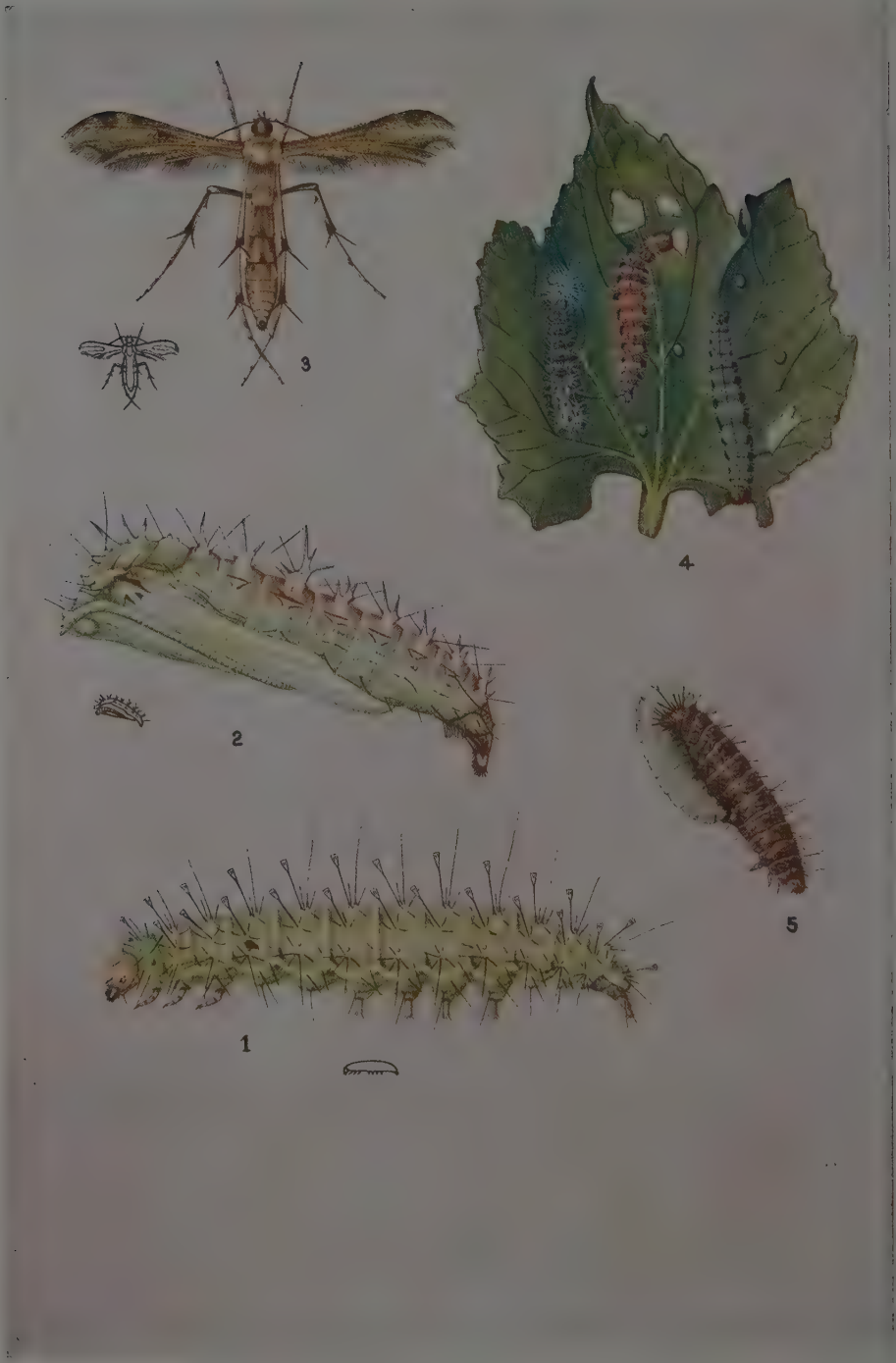
"The larva is generally rather sluggish but can be quite active, *e.g.*, if searching for food. If it loses its foothold, it drops by a silken thread. It feeds on the unripe seeds of *Boerhaavia repens*, commencing by eating the viscid exudation on the outside of the perianth tube, through which it then gnaws a hole and excavates the contents. Small insects, especially ants, are often seen to be caught by this gummy secretion, but the gum does not seem to incommode the larvæ at all; probably their extremely long prolegs are specially modified to carry them over it without touching it as they walk, and the long larval hairs prevent contact of the body with neighbouring drops of gum"(14).

"The larva seems to pupate almost invariably on the slender stem just below a seed-head, although I have once found an empty pupa-case attached to the mid-rib on the under-surface of a small leaf. The pupa hangs freely suspended, the discarded larval skin not being shrivelled up but stretched out at full length along the stem just above it. The rain soon destroys the empty pupa-cases and one finds only the anal portion with the discarded larval skin. The colour of the pupa is very variable; sometimes it is a light apple-green, sometimes a brownish-grey"(14).

BUCKLERIA WAHLBERGI, ZELL. (PLATE I, FIG. 2.)

Pterophorus wahlbergi, Zell., Linn. Ent. VI, 346 (1852)(1).
Pterophorus rutilalis, Wlk., Cat. XXX, 943 (1864)(2).
Trichoptilus pyrrhodes, Meyr., Proc. Linn. Soc. N.S. Wales (2) IV, 1113 (1889)(3).
Trichoptilus wahlbergi, Meyr., B. J., XVII, 134 (1906)(4); Fletcher, Spolia Zeylan, VI, 27-28, t. A f. 10 (1909)(5).
Buckleria wahlbergi, Fletcher, T. L. S. (2) XIII, 399, f. 2 (1910)(6).

This is a widely distributed species recorded from South Africa, St. Helena, Seychelles, India, Ceylon and Queensland(6). It is common throughout India and Ceylon and we have it from Kandy, Haldummulla and Madulsima



SPHENARCHES CAFFER.

EXPLANATION OF PLATE II.

SPHENARCHES CAFFER.

Fig. 1. Larva, natural size and magnified.
„ 2. Pupa, natural size and magnified.
„ 3. Moth, natural size and magnified.
„ 4. Eggs and larva on leaf, showing colour variation in larva.
„ 5. Larva attacked by a Hymenopterous parasite.

EXPLANATION OF PLATE II.

SPHENARCHES CAFFER.

Fig. 1. Larva, natural size and magnified.
" 2. Pupa, natural size and magnified.
" 3. Moth, natural size and magnified.
" 4. Eggs and larva on leaf, showing colour variation in larva.
" 5. Larva attacked by a Hymenopterous parasite.

(Ceylon), Palni Hills, Shevaroys, Coimbatore, Bangalore, Mercara, Pollibetta, Sidapur, Pusa, Shillong, Bhim Tal, Abbottabad, Peshawar and Parachinar.

The egg has been described as "of a smooth elongate-oval shape and of a very pale shining greenish-white colour. In size it is about 0·47 mm. long by about 0·32 mm. broad and 0·28 mm. high, a transverse section thus being oval. The newly-hatched larva is whitish, with a black head and long black dorsal hairs"([5]).

The full-grown larva is about 6·5 mm. long and about 1·25 mm. broad, cylindrical, slightly tapering towards either extremity, segments distinct, pale yellow slightly tinged with greenish; head pale yellow with some faint pinkish blotches and bearing longish hairs, these hairs especially evident on the front and some of them being knobbed apically; other segments with a distinct pinkish-brown mid-dorsal stripe and with interrupted lateral stripes, ventral area pale greenish-yellow; tubercles rather protuberant, each bearing a tuft of hairs of different lengths, the post-spiracular tubercle only having a single hair; short secondary hairs scattered over segments; spiracles protuberant, tubular; five pairs of equally developed, rather long, pale yellow prolegs. The larva feeds upon *Oxalis* sp., pupation taking place upon a leaf of the foodplant. The pupa is pale apple-green with whitish hairs as shown in figure.

SPHENARCHES CAFFER, ZELL. (PLATE II.)

Oxyptilus caffer, Zeller, Linn. Ent. VI, 348-349 (1852) ([1]).

Sphenarches caffer, Wlsm., Ind. Mus. Notes, II, 20 figs. ([2]); Cotes, *l.c.*, p. 163 ([3]); Meyr., Fauna Geogr. Maldives, I, ii. 125([4]); Lefroy, Ent. Mem., I, 220([5]); Fletcher, Spolia Zeylan., VI, 21-22, t. E ff. 8, 10, t.F f.11 (1909)([6]); Lefroy, Ind. Ins. Life, p. 528, f.343 (1909)([7]); Fletcher, T. L. S. (2) XIII, 399 (1910)([8]), South Ind. Ins., pp. 443-444, f.320 (1914)([9]), Proc. Second Entl. Meeting, pp. 44, 56, 306 (tab.) (1917)([10]).

Oxyptilus anisodactylus, Wlk., Cat. XXX, 934 (1864)([11]); Moore, Lep. Ceylon III, 528([12]).

Pterophorus diffusalis, Wlk., Cat. XXX, 945 (1864)([13]).

Oxyptilus walkeri, Wlsm., T. E. S. 1881, 279-280 (1881)([14]).

Sphenarches synophrys, Meyr., T. E. S. 1886, 17-18 (1886)([15]).

This is a remarkably widely-distributed species ranging through the whole of West, South and East Africa, the Seychelles and Maldive Islands, Ceylon, throughout India, Burma, the Philippines, Japan, Sumatra, Java, throughout Australia, New Hebrides, Tonga Islands, and the West Indies. This distribution has perhaps been caused to some extent by human agency.

Life-history. The egg is oval, cylindrical in section, and measures about 0·5 mm. in length. It appears smooth, though the outer surface is actually reticulate; the colour is an indefinite bluish-green, becoming yellow before hatching. Eggs are laid in spots determined by the ability of the moth to assume a position of rest; they never rest on the upper surface of a horizontal leaf but can rest on the lower surface of a leaf or place at any angle from the perpendicular to the horizontal; they appear always to hang from an object rather than rest on it; on the broad leaves of cucurbitaceous plants, eggs are laid on the lower surface; on the alternative foodplant, pigeon-pea, they are laid on the flower-buds and young pods. Eggs are usually laid singly, often only one on a pod or flower-bud, several on a young leaf. In the Insectary, 193 eggs were laid by two moths, all being laid at night. The eggs hatch in two days in warm weather up to six days in the colder weather of the North Indian winter:—

Eggs laid	Eggs hatched	Duration
7th September	9th September . . .	2 days.
8th „	11th „ . . .	3 „
9th „	12th „ . . .	3 „
16th „	19th „ . . .	3 „
9th February	15th February . . .	6 „

The larva emerges from the egg by biting away a small portion and then pushing through. The empty egg-shell is not eaten. On hatching the larva is about a millimetre long; the head is dark brown and shiny; there is a distinct prothoracic shield; the segments are well marked and on each segment there are five tubercles bearing from one to three hairs each; these tubercles are regularly arranged and form rows along the body; the round spiracle lies between the second and third tubercles. There are three pairs of thoracic legs and five pairs of prolegs.

The larva is of a yellowish-green colour on hatching, becoming green as it grows older and remaining of that colour; on the pods of pigeon-pea, which are coloured usually in green with brown stripes, the larva also has a lateral brown stripe and assimilates very closely to the colour of the pod; on green leaves of pumpkin, etc., it is green and this assimilates it to the pure green of the leaf. The larva alters little in appearance, during the various instars; in the last instar the dorsal three black tubercles are developed into more prominent protuberances; the first and third are yellow, the second black, each with

white hairs. There are also capitate smaller hairs on the upper part of each segment.

The larva, about half-grown, was described as "Head yellow. Other segments pale brownish-yellow. A narrow dorsal, latero-dorsal, and spiracular reddish stripe. Legs pale yellow, prolegs and claspers dark. Hairs white, except the short clubbed hairs which are black"(6).

The full-grown larva "is about 7 mm. long, cylindrical, rather stout, the segmental interstices well marked. Legs and prolegs long and slender; pale greenish-yellow. Head unicolorous, very pale, transparent greenish-yellow; mouth-parts darker. Other segments pale greenish-yellow; a narrow darker green dorsal line; each segment with a large but ill-defined, pinkish-red, latero-dorsal spot, the series of these spots forming an interrupted longitudinal line. Two conjoined latero-dorsal tubercles emit a very long white hair directed upwards and a shorter white palmate hair directed upwards and forwards; a supraspiracular tubercle emits a brown palmate hair directed upwards and forwards; two conjoined subspiracular tubercles emit a short white hair directed forward and a long white hair directed downward; there are also one or two latero-ventral tubercles emitting white hairs. The whole surface of the segments is also closely studded with short white clubbed secondary hairs"(6).

The larvæ feed on the leaves of pumpkin, eating small holes in them and not feeding in from the margin. In the case of pigeon-pea and other pulses, the larva eats into the flower-buds and pods, but never goes fully inside. The clothing of spines and hairs probably serves a protective purpose, since this larva feeds on hairy leaves and pods and is both in colouring and pilosity assimilated to the surface it is on; it is sluggish in movement and clings tightly where it is openly exposed upon the leaf or pod.

Pupa. Pupation takes place as follows:—The fullgrown larva spins silk upon the leaf or pod over a surface about 10 mm. by 8 mm. and then rests upon this, the anal prolegs firmly fixed in the end of it. The skin splits in front, and slips backwards along the body; on the underside of the eighth abdominal segment is a distinct bunch of curved hooks (cremastral pad), which engages in the silk as the larva wriggles; the hind end is then freed from the larval skin and the bunch of stiff recurved hairs on the eighth segment acting as a fixed point, the anal end by wriggling fixes the terminal bunch of hooks in the silk. The pupa is thus fastened by two points; its anterior half is free and can be raised till it is almost at right angles to the fixed abdomen.

"The pupa is about 7 mm. long and is attached to the undersurface of the mid-rib of a leaf of the foodplant. The appendage sheaths and anal portion are of a yellowish-green colour, the remainder of a very pale pinkish-red. The dorsal surface bears a system of highly specialized tubercles, the nature of which will be best understood by a reference to the figure (Plate F, figure 11)"(6).

The moth is shown in Plate II, figure 3. It measures 6-8 mm. and has a wing expanse of 13-15 mm. The wings are held out at right angles to the body when at rest. The moths are to some extent diurnal and fly by day; coupling takes place by day or night and lasts about 12 hours.

Duration of life-cycle. The winter life-cycle is longer than that of the hot weather or rains; it occupies nearly two months:

Egg ..	6 days.
Larva ..	30 ,,
Pupa ..	22 ,,
TOTAL ..	58 ,,

In February-March, it is:

Egg ..	6 days
Larva ..	20–21 ,,
Pupa ..	9 ,,
TOTAL ..	35–36 ,,

In September, it is:

Egg ..	2 days
Larva ..	17–20 ,,
Pupa ..	5 ,,
TOTAL ..	24–27 ,,

Occurrence. This insect may be found in active life throughout the year; there appears to be no definite stage in which it rests or hibernates, and the broods succeed one another irregularly from month to month. In the cold weather, as in the hot weather and rains, the larvæ are found on the different foodplants; these include the pigeon-pea (*Cajanus indicus*), *kulthi* (*Dolichos lablab*), the *kaddu* or bottle-gourd (*Lagenaria vulgaris*); the plant known as calabash is also stated to be the foodplant in West Africa. They are most noticeable on the flower-buds and pods of pigeon-pea in the early or late cold weather, since they are then associated with damage to this crop, caused also by *Exelastis atomosa*, Wlsm. It is uncertain how long the moth can live; in

captivity they die in a week or less, but this is no guide since they are not in normal conditions. Actually there are probably always available foodplants in India ; cultivated or wild forms of this gourd are grown constantly and in great profusion ; the pigeon-pea and lablab bean are extensively grown over India. Besides *Dolichos* and *Cajanus*, the larva of *S. caffer* has been found feeding on *Averrhoa bilimbi* (*bilimbi* tree), buds of *Luffa* sp., petals of *Hibiscus mutabilis*, *Biophytum sensitivum* and *Mimosa pudica* (sensitive plant), so that it is decidedly polyphagous and would apparently be able to hold its own in the absence of cultivated crops.

Practically nothing is on record regarding its distribution in India, but it seems to occur practically throughout India, Ceylon and Burma. The Pusa collection contains specimens from Madulsima, Haldummulla, Peradeniya, Coimbatore, Anamalais, Ootacamund, Pollibetta, Bababudins, Surat, Allahabad, Pusa, Bhim Tal, Sarai Saleh (Hazara), Peshawar, Shillong and Maymyo.

OXYPTILUS LACTUCÆ, n. sp.

Expanse 19 mm. Palpi porrect, second joint triangularly dilated with long scales, third joint long, slender ; ochreous, intermixed with white scales, third joint whitish above. Head tawny-ochreous. Antennæ blackish, white-ringed. Thorax tawny-ochreous, tegulæ ochreous. Legs whitish : posterior tibiæ broadly banded and dilated with reddish-brown scales at origin of spurs at 3/5 and apex ; spurs white, blackish apically, internal proximal spur longer than external and this latter longer than either of the equal distal pair ; posterior tarsi whitish, lined and banded with brown. (Abdomen broken.)

Forewing cleft from slightly beyond $\frac{1}{2}$: first segment parallel-sided, narrow, rather falcate apically ; second segment broadening posteriorly, apex produced, strongly falcate, anal angle well marked, termen concave : ochreous-tawny, irrorated with whitish and black scales ; an ill-defined whitish patch at base of cleft, tending to form a bar to costa ; first segment with narrow white bars at 2/5 and $\frac{3}{4}$ of length, these bars continued on to second segment. Cilia on costa broadly whitish opposite white bars, whitish before apex ; on termen whitish with fine brown streaks from apex of either segment ; on posterior margin of first segment pale ochreous to first white bar, from this to 5/6 brownish intermixed with scattered black scales, from 5/6 to apex ochreous white : on anterior margin of second segment ochreous-brown with a few white and black scales and a strong row of black scales between $\frac{1}{2}$ and 5/6 of segment ; on dorsum ochreous-brown, at $\frac{1}{2}$ a tuft of white scales, from about $\frac{3}{4}$ to slightly beyond first white bar on second segment whitish, beyond this

darker, with slight black scale-teeth at $\frac{1}{2}$ and $\frac{3}{4}$ and wisps of blackish hairs at 5/6 and anal angle, this last followed by a white wisp.

Hindwing cleft from about 2/5 and 1/6: first segment narrow, parallel-sided, rather blunt at apex; second segment narrower than first, gradually narrowing to apex; third segment almost linear, narrower than second, narrowing to apex: tawny-brown, thickly irrorated with black. Cilia dark tawny brown, paler within clefts; posterior margin of second segment with an ill-defined whitish wisp beyond $\frac{1}{2}$, third segment with a strong triangular black scale-tooth on dorsum at 2/3, between this and base dorsal area with a few scattered black and white scales, beyond this dorsal cilia faintly whitish basally.

Dehra Dun, October 1916 (*Ollenbach*). Bred from larvæ on lettuce. Three specimens, of which two are in poor condition.

This species is superficially much like a large, dark, strongly-marked *Sphenarches caffer*, from which it may easily be separated by the entire absence of black scales on the anterior margin of the third segment of the hindwing. It is possible that this species may be a *Sphenarches*, but I have been unable to determine satisfactorily the origin of vein 10 of the forewing.

OXYPTILUS EPIDECTES, MEYR.

Oxyptilus epidectes, Meyr., T. E. S. 1907, 476-477 (1908)(1); Fletcher, Spolia Zeylan, VI, 26, t. A f. 5 (1909) (2).

Originally described from Burma (Mon), Nilgiris, Coorg, Ceylon (Maskeliya) and Mauritius, this species is also known from Kandy and Madulsima and we have specimens from Madulsima and Haldummulla in Ceylon and from Pollibetta in South Coorg.

The moths have been bred from *Biophytum sensitivum*, which is evidently the foodplant(2).

OXYPTILUS CHORDITES, MEYR.

Oxyptilus chordites, Meyr., Exot. Micr., I, 106 (1913)(1).

Described from Colombo and Karwar(1).

Larva on *Calycopteris floribunda*(1).

OXYPTILUS PELECYNTES, MEYR.

Oxyptilus pelecyntes, Meyr., T. E. S. 1907, 477 (1908)(1).

This species was described from the Khasi Hills(1), where it is common, the larva feeding on *Scutellaria discolor*. We have it from Shillong and from Haldummulla (Ceylon).

OXYPTILUS CAUSODES, MEYR.

Oxyptilus causodes, Meyr., B. J., XVI, 582 (1905)(1) ; Fletcher, Spolia Zeylan., VI, 24-25, t. A f. 4, t. E f. 9 (1909)(2).

Originally described from Peradeniya(1, 2), this species also occurs in India and has been found at Pusa. The adult is, however, rarely seen, although easily bred from the larva which, in Ceylon, feeds inside the fleshy fruits of *Dillenia retusa*. In India it must have other foodplants, since, so far as I am aware, no species of *Dillenia* occurs at Pusa in the immediate vicinity of the locality where the adult moth has been taken.

"The full-grown larva (suspended for pupation) is about 13 mm. long by about 1·2 mm. broad, cylindrical, slender, shining, and appearing quite smooth and naked. There are two principal colour varieties, (1) wholly pale green without any noticeable markings except a narrow darker medio-dorsal stripe, and this is perhaps due to the vessels beneath showing through the skin rather than to any dermal pigmented area ; towards the anal extremity a pinkish suffusion is seen along the segmental interstices, (2) very pale semi-transparent pinkish flesh-colour, interstices of segments very pale semi-transparent green, as are also some patches along the sub-median area of most of the segments, but the pale green and pink so merge into one another that no definite areas can be described. Head very pale green. A pale red medio-dorsal line. But some larvæ have no green markings, being wholly pink. The prolegs are very small and stumpy ; hooks dark reddish. The hooks on the fourth pair of prolegs are attached into the silken pupation-pad. The arrangement of the tubercles is shown in the figure (Plate E, figure 9) "(2).

When full-fed the larva emerges from the fallen fruit "to suspend itself for pupation on any neighbouring object." "The larva pupates very rapidly ; twelve hours is sufficient for it to emerge from the fruit, select a suitable place for pupation, suspend itself, and complete its metamorphosis."

"The newly-formed pupa is of a bright light green colour, the capital extremity tinged with yellowish-brown about the base of the antenna-sheath ; but it soon becomes of an almost uniform reddish grey-brown. The moth, which usually seems to emerge early in the morning, appears after six days "(2).

XYROPTILA VAUGHANI, FLETCHER.

Oxyptilus vaughani, Fletcher, Spolia Zeylan., VI, 23-24 (1909)(1).

This species was described from Ceylon (Madulsima, Alutnuwara, Trincomali and Haldummulla). The early stages are as yet unknown, but the larva probably feeds inside the fruit of *Dimorphocalyx glabellus*(1), and the moth has been reared from a pupa found on a leaf of this shrub.

An egg, extruded by a captured female moth, was about 0·35 mm. long by 0·20 mm. broad, the ends rounded, uniform salmon-pink, the surface shining and covered with a series of large depressions.

DEUTEROCOPUS ALOPECODES, MEYR.

Deuterocopus alopecodes, Meyr., B. J., XXI, 105-106 (1911)(1).

Described from Karwar where the moths were found in August "from a single vine-plant on which the species was plentiful"(1). The larva presumably feeds on this vine, but this species is unknown to me.

DEUTEROCOPUS SOCOTRANUS, REBEL.

Deuterocopus socotranus, Rebel, Denk. Math-Nat. Ak. Wiss., LXXII, pt. ii, pp. 85-87, fig. (1907)(1); Fletcher, T. E. S., 1910, 124-130, ff. 3, 4, t. 44 f. 8, t. 45 f. 1(2).

Deuterocopus tengstrœmi (*nec* Zell.), Meyr., B. J., XVII, 134 (1906)(3).

Deuterocopus viticola, Meyr., B. J., XXI, 104-105 (1911)(4).

This species * is very widely distributed, its range extending from West Africa, S.E. and East Africa, Sokotra, through India, Ceylon, Sumba, Tambora and Amboyna to New Guinea and Queensland. In India, Ceylon and Burma it is common in most districts and we have it from Hambantota, Coimbatore, Surat, Pusa, Moulmein and Minbu. At Pusa it has been reared from larvæ on *Vitis trifolia*.

"The larva feeds in Ceylon on the flowers of the square-stemmed jungle vine (*Vitis quadrangularis*) . . . . . The following is a brief description from a living larva found at Hambantota :—Length 7 mm., stout, stoutest at about mid-length, decreasing rapidly anally ; head capable of retraction into or under prothorax. Incisions between segments distinctly marked. Colour a uniform pale green ; head yellowish-brown and prothorax dark blackish-purple. Prothoracic legs purple, other legs and prolegs pale green ; legs and prolegs rather short and stout. To the naked eye no hairs are visible except two pairs of short whitish curved hairs on the anal segment and a pair of short submedian hairs, directed forward, on each thoracic segment. Spiracles high-placed, about half-way up the side, fairly conspicuous from being outlined in a slightly lighter green tint than that composing the general colour

* Mr. Meyrick(4) considers that the form described by me as *socotranus*(2) consists of heterogeneous material. The true *socotranus* is possibly truly distinct, as indicated in my paper on this genus, but examination of over one hundred specimens ranging from West Africa to New Guinea failed to provide me with any satisfactory method of separating these into true species, and I adhere to my former expression of opinion on this point. An almost exactly similar case is provided by *Buckleria defectalis*, Wlk.

of the larva. Movements slow and deliberate, spinning a thread as it moves along and when it drops. Under the microscope the skin is seen to be covered with minute skin-points as if shagreened "(2).

"The pupa is attached to a flower, flower-stalk or stem of the foodplant, or more rarely to a leaf of the same, and is usually enclosed in a very flimsy cocoon composed of a few silken threads. It is possible, however, that these threads are merely fortuitous, having been spun by the larva during its search for a suitable pupation-place or whilst preparing its cremastral pad. The pupa is about 6 mm. long, stout, smooth, rounded and blunt at the capital extremity. Its usual colour is a pale apple-green, marked with dark or pinkish-red on the dorsal surface, the markings usually consisting of (1) a narrow median thoracic stripe broadening posteriorly into a transverse bar extending obliquely downwards to about the edge of the wing-covers, and (2) a series of submedian patches on the second to fifth abdominal segments forming a more or less interrupted longitudinal stripe. Some pupæ, however, which had pupated in my boxes, were wholly of a dark-grey colour. The moth emerges in the early morning "(2).

DEUTEROCOPUS PLANETA, MEYR.

Deuterocopus planeta, Meyr., T. E. S., 1907, 473-474 (1908)(1); Fletcher, T. E. S., 1910, 131-134, f. 5, t. 44 f. 10, t. 45 f. 2 (1910)(2).

Deuterocopus rubrodactylus (*nec* Pag.), Fletcher, Spolia Zeylan., VI, 20, t. E f. 7 (1909)(3).

This species ranges from Ceylon, Khasi Hills and Burma to Portuguese Timor, Tenimber and New Guinea(2). We have it from the Bababudin Hills and Pollibetta (South Coorg).

"The egg is about 0·44 mm. long by about 0·20 mm. broad; in shape it is ovo-cylindrical, the ends rounded and subequal, the micropylar area distinctly depressed; the surface is very smooth and shining, of a very pale orange colour, suffused with red at either pole "(2).

The larva feeds on the flowers of *Leea sambucina* and is "pale green without any markings except red suffusion at either extremity. The skin is roughened into minute knobs (like shark skin) everywhere, but especially on the ventral region. A distinct subsegment is formed on the posterior ventral region of abdominal segments. The hairs, except (i), are very short and inconspicuous; (i) is short, less than breadth of segment. The hairs are transparent whitish (glassy) and the tubercles very indistinct. The hairs are longest on thoracic and anal regions. The legs are extremely short and inconspicuous. There are no secondary hairs, these seeming to be reduced

to skin-points or rather rugosites of the skin." A sketch showing the arrangement of the tubercles is given in *Spolia Zeylanica*, VI, t. E. f. 7.

The pupa is "brown with a broad lighter ochreous-fuscous central band; very few hairs or projections. It was suspended anally to a flower-stalk within a slight attempt at a cocoon—a few silken threads spun around it to form a spacious but flimsy enclosure, in which the pupa was fully visible. The cast larval skin remained at the anal extremity of the pupa"(2).

DEUTEROCOPUS RITSEMÆ, WLSM.

Deuterocopus ritsemæ, Wlsm., Notes Leyden Mus., VI, 243 (1884)(1); Fletcher, T. E. S., 1910, 134-138, f. 6, t. 44 ff. 11, 12 (1910)(2).

Deuteroscopus rubrodactylus, Pag., Abh. Ges. Zool., XXIX, 241(3).

This species occurs in Ceylon, Assam, Tenasserim, and from Borneo to New Guinea(2). We have specimens from Kandy and Pollibetta.

The early stages are as yet practically unknown. The moth has been bred by me in June 1908 at Galle from pupæ, "found suspended anally from the upper surface of leaves of *Leea sambucina*, which is evidently the food-plant. The different method of suspension, as compared with the pupa of *D. planeta*, is noteworthy. On the same bush I found a larva feeding inside an unopened flower-bud; it appeared to be very similar to that of *planeta* but wanted the terminal red suffusion; unfortunately I failed to rear it"(2).

PLATYPTILIA CITROPLEURA, MEYR.

Platyptilia citropleura, Meyr., T. E. S., 1907, 482 (1908)(1); Fletcher, Spol. Zeylan., VI, 15 (1909)(2); Meyrick, Entom. Mitteil., Suppl. No. III, p. 46 (Jan. 1914)(3).

This species has been recorded from Maskeliya (Ceylon)(1), the Khasis(1) and Formosa(3). I found it not uncommonly in the larval stage at Maskeliya in March 1909 but have never seen any specimens in the Khasi Hills.

The larva feeds inside the seed-capsules of *Begonia* sp., both cultivated and wild varieties. A full-grown larva found at Maskeliya on 7th March 1909 was described as 6 mm. long, stoutly built, thickest about mesothorax and gradually tapering posteriorly; head pale yellow without any markings except the black ocelli and ferruginous jaws; other segments creamy-yellow with a narrow pale ferruginous median line ill-defined anteriorly; a broader pale ferruginous lateral line passes just above the spiracles, which are high-placed; each segment divided transversely by a vertical constriction of the skin-surface into two sub-segments of which the anterior is one-and-a-half to twice as large as the posterior; legs and prolegs transparent pale yellow,

Fig. 1. *Platyptilia taprobanes*:—
a, Larva;
b, Pupa;
c, Moth, natural sizes and magnified.

Fig. 2. *Platyptilia brachymorpha*:-
Pupa (x 6).

PLATYPTILIA PUSILLIDACTYLA.

EXPLANATION OF PLATE IV.

PLATYPTILIA PUSILLIDACTYLA.

Fig. 1. Twig of *Lantana camara*, showing leaves, flowers (orange-yellow variety) and fruits (natural size).

„ 2. Egg, as laid on flower, magnified (×7).

„ 3. Egg, more highly magnified (×43).

„ 4. Flower attacked by larva. Note sickly appearance in comparison with healthy flower on left.

„ 5. Flower attacked by larva, opened up, showing larva at base of flowers, magnified.

„ 6. Larva, magnified (×7).

„ 7. Fruit-cluster formed from flower-head in which a larva has fed and pupated. Note scanty formation of fruits in comparison with healthy cluster on left.

„ 8. Enlarged view of attacked flower-head in which a larva has pupated. The head of the pupa is seen projecting from the interior of cocoon which has been partially opened.

„ 9. Pupa, magnified (×7).

„ 10. Moth, in resting position, natural size.

„ 11. Moth, with wings expanded, magnified.

EXPLANATION OF PLATE IV.

PLATYPTILIA FUSILLIDACTYLA.

Fig. 1. Twig of *Lantana camara*, showing leaves, flowers (orange-yellow variety) and fruits (natural size).

" 2. Egg, as laid on flower, magnified (×7).

" 3. Egg, more highly magnified (×43).

" 4. Flower attacked by larva. Note sickly appearance in comparison with healthy flower on left.

" 5. Flower attacked by larva, opened up, showing larva at base of flower, magnified.

" 6. Larva, magnified (×7).

" 7. Small cluster formed from flower-head in which a larva has fed and pupated. Note scanty formation of fruits in comparison with healthy cluster on left.

" 8. Enlarged view of attacked flower-head in which a larva has pupated. The head of the pupa is seen projecting from the interior of cocoon which has been partially opened.

" 9. Pupa, magnified (×7).

" 10. Moth, in resting position, natural size.

" 11. Moth, with wings expanded, magnified.

PLATYPTILIA FUSILLIDACTYLA.

hooks of latter black; the whole surface of the body thickly covered with minute black spiracles and more sparsely with short white secondary hairs; primary hairs rather short white, warts inconspicuous.

Another larva was of a pale greenish-yellow, the ferruginous markings barely represented by a slight darkening of the ground-colour.

The pupa is attached to the outside of a seed-capsule of the foodplant. It is about 7 mm. long, moderately stout, dull pale yellow, with an indistinct dorsal ferruginous stripe and a broad ferruginous lateral stripe reaching to the spiracles; the sixth segment with a large flattened latero-dorsal tricuspidate halberd-shaped projection; seventh to eleventh segments with smaller projections directed anteriorly; cremaster double.

A larva which suspended itself on 8th March pupated that night and emerged on 17th March.

PLATYPTILIA TAPROBANES, FELD. (PLATE III, FIG. 1.)

Platyptilia taprobanes, Felder, Reise "Novara", t. 140 f. 54([1]); Moore, Lep. Ceylon, III, 527([2]); Meyrick, T. E. S., 1907, 482 (1908)([3]); Fletcher, Spol. Zeylan., VI, 14 (1909)([4]).

Platyptilia sythoffi, Snell., Tijd. v. Ent., XLVI, 54, t. 5 ff. 15, 16([5]).

This species is known from Ceylon (Hills)([4]), Palnis([3]), Khasis([3]) and West Java([5]). We have specimens from Madulsima, the Shevaroys, Coimbatore, Pusa and Shillong.

At Shillong the larva feeds commonly on *Scutellaria discolor*. The figure is taken from a spirit specimen.

PLATYPTILIA PUSILLIDACTYLA, WLK. (PLATE IV.)

Oxyptilus pusillidactylus, Wlk., Cat. XXX, 933 (1864)([1]).

Platyptilia pusillidactyla, Wlsm., P. Z. S., 1891, 495([2]), *id.*, *l.c.*, 1897, 57([3]); Meyr., T. E. S., 1907, 483 (1908)([4]); Fletcher, Spol. Zeylan., VI, 13, t. A f. 2, t. E ff. 5, 6 (1909)([5]), T. L. S. (2) XIII, 313 (1909)([6]), *l.c.*, 399-400 (1910)([7]), S. Ind. Ins., p. 444, f. 321 (1914)(7A), Entl. Note 73 (1916)([8]), Proc. Second Entl. Meeting, p. 39 (1917)([9]).

Platyptilia tecnidion, Zell., Hor. S. E. Ross, XIII, 468-469, (t. 6 f. 162 (1877)([10]).

Platyptilia hemimetra, Meyr., T. E. S., 1886, 18([11]), B. J., XVII, 135 (1906)([12]).

Platyptilia lantana, Busck, Insec. Inscit. Menstr. II, 103-104 (1914)([13]).

Originally described from Jamaica([1]) this species is very widely distributed and has been recorded from the West Indies([2, 3]), Mexico([5]), Reunion([12]), India([7-9]), Ceylon([5]), Hongkong([7]) and Hawaii([7, 18]). It was introduced into Hawaii from Mexico to aid in reduction of *Lantana* infestation, but its

distribution in other regions appears to be natural. It is abundant in India, Ceylon and Burma in every district which has been invaded by *Lantana*, and we have specimens from Trincomali, Kandy, Haldummulla, Madulsima, Peradeniya, Ootacamund, Sidapur, Pollibetta, Coimbatore, Bababudin Hills, Pusa, Shillong and Maymyo, and also from Honolulu.

"The egg is about 0·4 mm. long by about 0·22 mm. broad, and is of a very pale greenish-yellow colour (almost colourless); one end seems larger than the other and this larger end is studded with little prominences, especially noticeable in the micropylar area"(5).

The egg is 0·33 mm. long and 0·17 broad, pale yellow, opalescent, in outline ellipsoid, somewhat flattened, translucent, the surface covered with an irregular network of ridges. It is laid among the spines on the sepals of the florets of *Lantana camara*, sometimes on the leaves or on the petals. (Y. Ramachandra Rao's *Lantana* Cage-slip 1.)

Eggs laid at Coimbatore on 8th-9th December hatched on 12th-13th December.

The newly hatched larva is less than 1 mm. long, pale, translucent, head shiny black, prothoracic shield pale brown.

"The larva is stout, pale yellow and naked—at least, no hairs are visible to the unaided eye. The larva is usually found coiled round at the base of the flower-tubes in the interior of a *Lantana* flower"(5).

The larva is about 6 mm. long and about 1 mm. broad, cylindrical, uniform chrome-yellow; head light brown; five pairs of small thin prolegs.

The larva is found boring the thickened rachis [of *Lantana camara*] in which its tunnel may be found; it also bores into the sessile fruits from inside the tunnel only to eat the substance of the seed. It never comes out of its tunnel. Before pupating it forms a sort of cocoon by lining the tunnel with white silk and covering the mouth of the tunnel by a silken arch on which black pellets of excrement may remain attached. (Pusa Insectary Cage-slip 815).

Besides *Lantana camara*, the larva feeds in the flowers of *Lantana indica* and *Lippia geminata*.

"The pale yellow pupa is to be found in a sort of chamber gnawed into the side of the fruit receptacle, a regular cocoon being formed of bits of vegetable matter spun together with silk. The emerged pupæ are usually found projecting half-way out of the cocoon amongst the ripening fruit, such bunches of fruit being far less productive than unattacked ones"(5).

The pupa is about 5 mm. long, cylindrical, tapering to a point posteriorly, uniform chrome-yellow; legs-cases free ventrally and produced nearly to

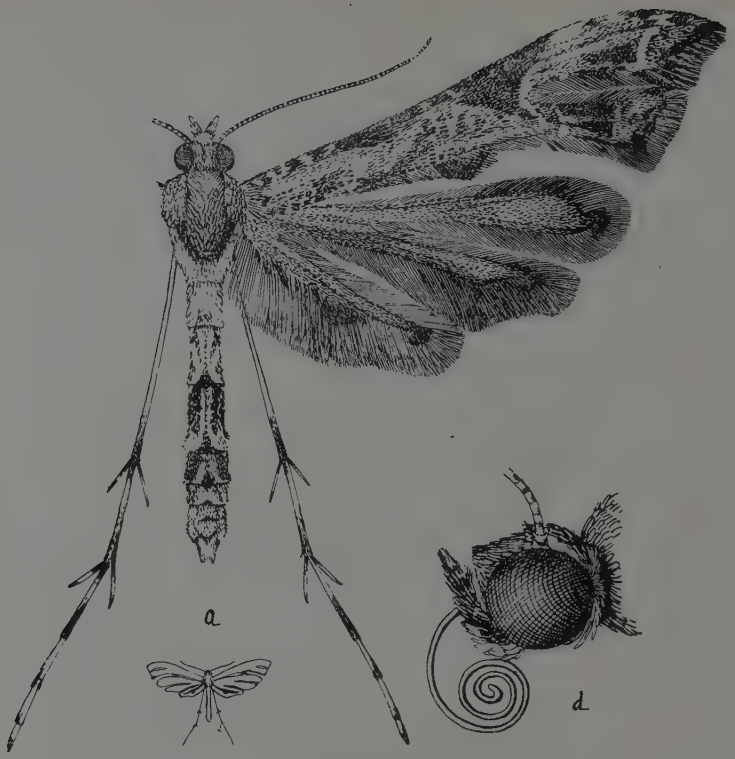


Fig. 1. *Platyptilia direptalis*:—
a, Moth, natural view size and magnified (x 9);
d, Side view of head, more highly magnified.

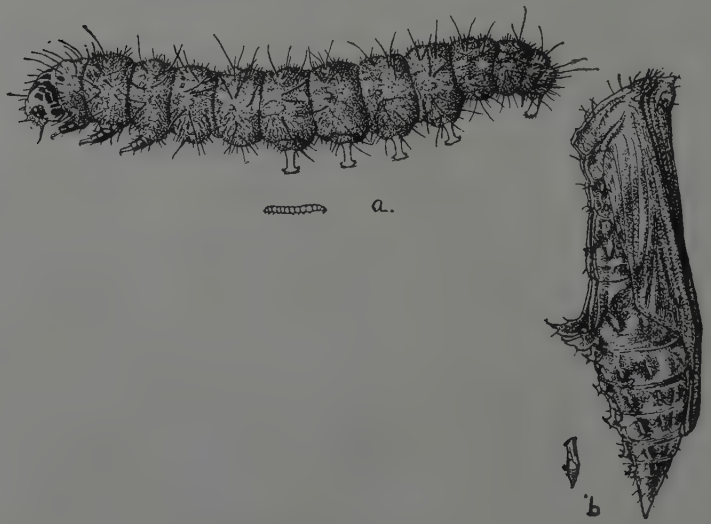


Fig. 2. *Platyptilia direptalis*:—
a, Larva;
b, Pupa, natural size and magnified.

anal extremity ; each abdominal segment dorsally with two raised elongated ridges ; anal segment with several thin curved-tipped hairs. (Pusa Insectary Cage-slip 815.)

The pupal period is about four days in the hot weather and about a week in the winter.

PLATYPTILIA BRACHYMORPHA, MEYR. (PLATE III, FIG. 2.)

Platyptilia brachymorpha, Meyr., T. E. S., 1888, 240 (1888)(1), B. J., XVII, 135 (1906),(2) T. E. S., 1907, 483 (1908)(3) ; Fletcher, Spol. Zeylan., VI, 12, t. A f. 3 (1909)(4), T. L. S. (2) XIII, 401 (1910)(5).

Platyptilia seeboldi, Hofm., Iris, XI, 33 (1898)(6).

This is a widely distributed species recorded from Syria, India, Ceylon, South Africa, Aldabra, and Hawaii(5). In India and Ceylon it seems to occur in the Plains. We have it from Kegalle, Sidapur, Pollibetta, Pusa, Chakradharpur and Pyinmana (Burma).

It has been reared at Pusa from larvæ collected on *Celsia coromandeliana* on 7th February 1906 and 1st March 1913 and from a pupa found on an unidentified yellow-flowered Solanaceous plant on 5th April 1918.

The larva bores into flower-buds of *Celsia coromandeliana* and eats the anthers. It is, when full-grown, about 8 mm. long and rather more than 1 mm. broad, cylindrical, tapering slightly towards either extremity, segments distinct, brownish-grey with a pinkish-grey dorsal line deeper in colour posteriorly ; head bilobed, shiny, translucent pale yellowish-brown with black specks and minute hairs ; thorax with minute black spots and dull-white tufts of hairs ; legs well developed ; abdominal segments rather darker tinged ; prolegs pale yellow ; anal segment with a large black spot ; tufts of small hairs on segments. (Pusa Insectary Cage-slip 978.) Another larva was described as yellowish-green, dorsal line deeper green. (Pusa Insectary Cage-slip 300A.)

Pupation takes place on the foodplant. The pupa is about 8 mm. long and slightly more than 1 mm. broad, yellowish-green with a pale crimson dorsal line posteriorly from thorax, abdominal segments with pale crimson lines. The pupal period is seven or eight days. (Pusa Insectary Cage-slip 978.)

PLATYPTILIA DIREPTALIS, WLK. (PLATE V.)

Oxyptilus direptalis, Wlk., Cat. XXX, 934 (1864)(1).

Platyptilia direptalis, Meyr., T. E. S., 1907, 485 (1908)(2) ; Fletcher, Spol. Zeylan., VI, 12 (1909)(3).

Originally described from the Cape of Good Hope(1), this species has since been recorded from Ceylon (Pattipola), the Palnis, Nilgiris and Simla(2). We have it from Dungagali (8,000 feet ; Hazara District), Pusa and Shillong.

At Shillong the larva is found commonly on *Teucrium quadrifarium* and *Scutellaria discolor*. Figures 1*a* and 1*b* are made from spirit specimens of the larva and pupa.

PLATYPTILIA MOLOPIAS, MEYR.

Platyptilia molopias, Meyr., B. J., XVII, 135 (1906)(1) ; Fletcher, Spol. Zeylan., VI, 12-13, t. A f. 1, t. E f. 4 (1909)(2).

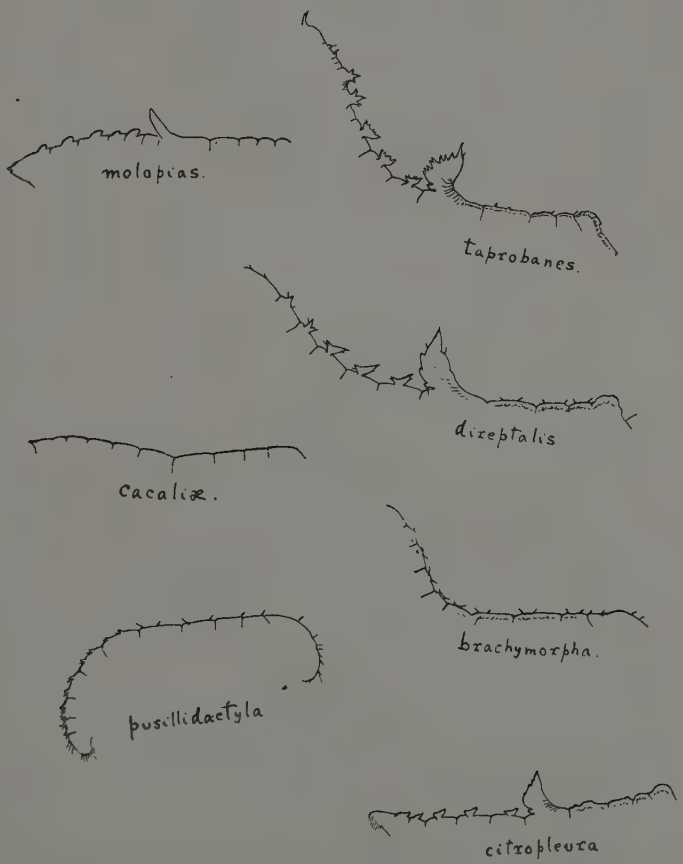
This species is common in the Hill Districts of Ceylon but does not appear to have been found in India hitherto. We have it from Maskeliya, Haldummulla and Pattipola.

" The egg is about 0·47 mm. long by about 0·3 mm. broad, the micropylar end distinctly the larger and flattened ; in colour it is of a very pale green, the surface reticulated with large but shallow rounded depressions.

" Larvæ were found on 18th May 1908 at Madulsima, feeding on the flowers and unripe seeds of *Teucrium tomentosum*. The larva is of a very pale green colour and is very difficult to discern when *in situ* on the foodplant. Half-grown examples often seem to have a narrow reddish medio-dorsal stripe, lacking in adults, which latter have sometimes some lateral reddish markings on the thoracic segments. Like all " plume " larvæ, however, this one is very variable in colour, and some examples might be described as reddish with a greenish latero-dorsal suffusion on the abdominal segments. The head is yellowish or pale green, the ocelli very distinctly marked in black. The segmental divisions are sharply distinct. All primary hairs are white ; the longest hairs are a little longer than the diameter of the segments on which they arise. The legs are yellowish-green, extremities of claws yellowish. Prolegs very transparent pale green, hooks reddish. Spiracles very inconspicuous. Secondary hairs short, black.

" The pupa is suspended freely by the tail from an empty flower-sheath of the foodplant. It is rather short, the appendage sheaths very long and well separated. Colour a pale flesh-pink, mottled longitudinally with brown ; head and wing-sheaths pale greenish, the latter with longitudinal brown shading. Dorsal prominences small, distinct, subequal, directed forward, except the first, which is extremely large, directed backwards, blunt, but tipped anteriorly with a sharp spine whose point is bent forward. This large prominence is sharply outlined by a deep brown shading which reaches obliquely anteriorly half-way across the wing-cover. A second brown shade, parallel to the first but less intense and narrower, occurs on the sixth segment, but barely reaches on to the wing-sheath.

" The moth emerges from the pupa after about a week "(2).



Outlines of dorsal segments of pupæ of various species of *Platyptilia* (x 7).

PLATYPTILIA CACALIÆ, n. sp.

Male and female. Expanse 16 mm. Palpi porrect, short, second joint dilated with scales, third with short rough scales, short, acuminate; greyish, fuscous externally. Head greyish-fuscous. Antennæ greyish, obscurely ringed with fuscous. Thorax greyish-fuscous. Legs whitish, dilated with brownish scale-tufts at apices of tarsi; posterior tibiæ greyish, irrorated with fuscous and obscurely broadly banded at origins of spurs which are whitish, brownish at base and apex. Abdomen moderately long, greyish, irrorated with fuscous which tends to form a patch in middle of back.

Forewing cleft from about $\frac{3}{4}$: first segment broadening posteriorly, apex falcate, posterior angle well marked; second segment broadening posteriorly, both angles well marked, termen sinuately convex: brownish-grey irrorated with white and reddish-brown: costal area strongly irrorated with blackish; an elongate blackish dot in cell beyond 1/3; a large blackish costal triangle at 2/3, its apex running obliquely into basal half of second segment, its outer edge irregular and not touching base of cleft; first segment with very ill-defined whitish bars at $\frac{1}{4}$ and $\frac{3}{4}$, first only evident towards costa, second followed by a clearly-defined terminal blackish suffusion narrowest at apex and broadening regularly to posterior margin of segment; second segment with clearly defined blackish suffusion on posterior fourth, preceded by an ill-defined whitish bar. Cilia on costa blackish with a few scattered whitish scales, beyond costal triangle narrowly whitish, and mixed with whitish before apex; on termen ochreous-white, black at base; within cleft ochreous-white with a few scattered black scales, black opposite terminal black suffusion; on dorsum ochreous-white with scattered black scales tending to form a broad weak scale-tooth at about 3/5.

Hindwing cleft from about 2/5 and 1/6: first segment dilated posteriorly; second segment dilated posteriorly, subtriangular, apex very acute, termen concave, hinder angle distinct; third segment sublinear, tornus almost obsolete: fuscous-grey, irrorated with fuscous-brown. Cilia brownish-grey; around apex and tip of second segment blackish; on dorsum paler, with a rather weak black scale-tooth at about $\frac{1}{2}$, preceded by a few scattered black scales and followed by a smaller number of weaker black scales.

Coimbatore; 5th December 1917 (*Fletcher*). Adults flying over flowers of *Cacalia coccinea*, in the flower-heads of which the larvæ and pupæ were found. Twelve specimens.

This species is superficially very like *P. molopias*, but is evidently distinct from the form of the pupa. At the time of capture it was supposed to be *P. molopias* and no description of the larva was made.

PLATYPTILIA GONODACTYLA, SCHIFF.

Alucita gonodactyla, Schiff. and Den., Schmett. Wien., p. 320 (1775)(1).

Platyptilia gonodactyla, Tutt, Brit. Lep., V, 201-219 (1906)(2); Meyr., Rec. Ind. Mus., V, 217(3).

This is a widely-distributed European species which extends into the Northern portion of the Indian Region. It has been recorded from Darjiling(3) and Rawalpindi(3).

In Europe the larva feeds on *Tussilago farfara*. The early stages are described at length by Tutt(2), but have not been found in India as yet.

STENOPTILIA ZOPHODACTYLA, DUP.

Pterophorus zophodactylus, Duponchel, Hist. Nat., XI, 668, t. 314 f. 4 (1838)(1).

Adkinia zophodactylus, Tutt, Brit. Lep., V, 319-334 (1906)(2).

Stenoptilia zophodactyla, Meyr., Ent. Mo. Mag., 1907, 146 (1907)(3), T. E. S., 1907, 504 (1908)(4); Fletcher, Spol. Zeylan., VI, 10-11, t. E f. 3 (1909(5).

This is a widely distributed species, known from Central and Southern Europe, Asia Minor, Armenia, India, Ceylon, Eastern Australia and Argentina. We have specimens from Lunugala (Ceylon), Ootacamund, Bababudin Hills (Mysore), Pusa, Peshawar, Abbottabad, Kashmir, Parachinar, Hangu (Kurram Valley) and Cherrapunji.

Very detailed descriptions of the egg, larva and pupa, taken from English specimens, are given by Tutt, pages 322-331(2). The following descriptions of the larva and pupa were made from Sinhalese specimens :—"The larva, at rest and apparently about full-fed, is about 10 mm. long, stout, stoutest about third segment and tapering thence gradually. Head pale yellow with black ocelli. Colour a pale green, the spiracles narrowly ringed with black; they are situated about half-way up the segments but do not seem raised above the skin-surface at all. There is a broad medio-dorsal stripe, purple at the edges, but very dark internally. This is narrowly and obscurely edged by a narrow whitish-green longitudinal stripe, of a tint slightly paler than the ground-colour. Half-way between the lower edge of this stripe and the spiracle is a second similar whitish-green stripe, and a third similar stripe occurs on the latero-ventral surface at a distance below the spiracle equal to that of the second stripe above it. The two latero-dorsal setigerous tubercles are situated at a horizontal distance apart equal to about one-third of the width of the segment; the foremost one bears a short black hair, the aftermost a similar white hair; the tubercles themselves are very small and inconspicuous. Just above the spiracle occurs a short white hair, directed outwards.

Just below the spiracle are (1) a very short white hair directed forward, (2) a short white hair directed backward. The whole body, particularly on the dorsal and ventral regions, is thickly covered with minute short black bristly hairs. The legs are fairly large and are yellowish in colour ; prolegs rather small, greenish yellow. The larva feeds on the flowers and seeds of *Sopubia trifida.*

" In the case of another larva, the sixth and eleventh segments had a round pale spot in the purple dorsal stripe on each side of its central darker line.

" The pupa is long and narrow, of a pale yellowish-green colour with a broad purplish-red dorsal stripe ; the usual white hairs are so short that they are only just perceptible under a lens. The larval skin is discarded entirely and is shrunk up into a minute pellet. The pupa is capable of rapid and violent motions in the ventro-dorsal plane, the head being bent backwards dorsally until it touches the anal extremity. The pupa is suspended head downwards, ventral surface against support "(5).

At Pusa this species has been reared from larvæ found on *Kukraunda* (*Blumea balsamifera*) on 18th February 1908. The larvæ were feeding on the green leaves from which they dropped by a thread when disturbed ; the larva does not eat the edge of the leaf but nibbles small holes in the upper, and occasionally in the lower, surface of the leaf. Its movements are sluggish.

The larva was described as about 8 mm. long and 1·5 mm. broad, cylindrical, tapering posteriorly, yellowish-green ; head green, tinged with yellowish or brownish anteriorly, covered with microscopic white hairs ; prothorax with two transverse rows of white spinous hairs and with smaller dark secondary hairs ; legs greenish-yellow ; abdominal segments distinctly segmented, with an irregular interrupted dull yellowish lateral stripe and a deep green dorsal stripe, tubercles armed with bunches of white spines and black hairs ; spiracles small, round, black.

Pupation takes place on the surface of a leaf, the pupa being very similar in colour to the larva. Before pupation the larva applies a long narrow network of silken threads to the surface of a leaf and the pupa attaches itself to this by the double set of cremastral hooks. The pupa is about 8 mm. long and 1·5 mm. broad across thorax, head depressed, thoracic region prominent, tapering almost to a point anally ; a few white spiny hairs scattered over surface ; a brownish dorsal stripe ; wing-cases nearly reaching anal extremity. One individual, which pupated on 26th February, emerged on 7th March 1908. (Pusa Insectary Cage-slip 652.)

EXELASTIS LIOPHANES, MEYR.

Marasmarcha liophanes, Meyr., T. E. S., 1886, 19([1]).

Exelastis liophanes, Meyr., B. J., XVII, 136([2]); Fletcher, Spol. Zeylan., VI, 33-34, t. A f. 12 (1909)([3]), T. L. S. (2) XIII, 403 (1910)([4]).

Leioptilus griseodactylus, Hofm., Zoologica, XXIX, 240 (1900)([5]).

Originally described from Reunion([1]), this species has been recorded from Barbados, Natal, Seychelles, Ceylon, Formosa, China (Fuchau) and the Bismarck Archipelago. It is abundant throughout the Plains of India, Burma and Ceylon, and we have specimens from Haldummulla, Peradeniya, Coimbatore, Virajpet (S. Coorg), Cuttack, Hoshangabad, Pusa, Palamau, Lunding (Assam), Shillong, Lashio, Tatkon and Myitkyina.

This species was bred at Pusa in July 1910 from pupæ found on the upper surfaces of leaflets of *Oxalis* sp. The larva has not been noted, but almost certainly feeds on *Oxalis*, probably on the flowers.

EXELASTIS PHLYCTÆNIAS, MEYR.

Marasmarcha phlyctœnias, Meyr., B. J., XXI, 106 (1911).

Described from Trincomali and Puttalam and from North Coorg. We have specimens from Colombo, Kegalle and Haldummulla. The early stages are unknown.

EXELASTIS ATOMOSA, WLSM. (PLATE VII.)

Aciptilia atomosa, Wlsm., P. Z. S., 1885, 885([1]).

Exelastis atomosa, Meyr., B. J., XVII, 730([2]); Lefroy, Ent. Mem., I, 210, ff. 67, 68([3]), Ind. Ins. Life, pp. 527-528, t. 53([4]); Fletcher, S. Ind. Ins., pp. 444-445, t. 38 (1914)([5]), Proc. Second Entl. Meeting, pp. 44, 56 (1917)([6]).

Exelastis parasita (Meyr., *ined.*), Lefroy, Ind. Ins. Pests, p. 140, figs.

Pterophorus ebalensis, Rebel, Lep. Sokotra, p. 84 (1907)

nec

Exelastis atomosa, (*nec* Wlsm.), Fletcher, Spol. Zeylan., VI, 33, t. A f. 11 (1909) [=*phlyctœnias*, Meyr.].

Originally described from Bombay ([1]), this species is widely distributed in the Plains of India, but does not appear to occur in Ceylon, where it is replaced by *E. phlyctœnias*, Meyr. It is an important pest of *Cajanus indicus* and *Dolichos lablab*. We have it from Peshawar, Abbottabad, Pusa, Samastipur, Bilaspur (C. P.), Hoshangabad, Bhopal, Baroda, Poona, Yemmiganur (Bellary) and Coimbatore.

Outside of India, *E. atomosa* is known from Natal, Sokotra, and New Guinea. It will probably be found to be widely distributed throughout the tropical regions of the Old World.

EXPLANATION OF PLATE VII.

EXELASTIS ATOMOSA.

Fig. 1. Eggs on pod of pigeon-pea (*Cajanus indicus*).
" 2. Eggs, magnified.
" 3. Larva, magnified.
" 4. Second and third abdominal segments of larva.
" 5. Pupa on pod of pigeon-pea (*Cajanus indicus*), magnified.
" 6. Moth, in normal resting position.
" 7. Moth, with wings expanded.

(The hair-lines show the natural sizes.)

EXPLANATION OF PLATE VII.

EXELASTIS ATOMOSA (Wlsm.).

Fig. 1. Eggs on pod of pigeon-pea (*Cajanus indicus*).
„ 2. Eggs, magnified.
„ 3. Larva, magnified.
„ 4. Second and third abdominal segments of larva.
„ 5. Pupa on pod of pigeon-pea (*Cajanus indicus*), magnified.
„ 6. Moth, in normal resting position.
„ 7. Moth, with wings expanded.

(The hair-lines show the natural sizes.)

EXELASTIS ATOMOSA.

Life-history. The egg is oval in outline, round in section, measuring about half a millimetre in length. It is, when laid, light green or bluish, becoming yellower as it approaches hatching. Eggs are laid at night, each egg singly, several being found on each young pod, flower-bud or young leaf. They are difficult to find and escape notice unless one knows what they are like and is looking specially for them. Eggs hatch in three and a half to four days in warm weather, in five to six days in the winter in the Plains. The larva simply bites a hole in the egg and crawls out, leaving the empty white egg-shell which it does not eat. (Plate VII, figs. 1, 2.)

Larva. The newly-hatched insect is about one millimetre long, yellow, the segments covered with short hairs. As it grows older the colour becomes green, or green with brown markings, closely resembling the colouring of the pod it is feeding on. The segments are clothed in hairs and capitate spines, the latter in distinct rosettes. There are five pairs of green prolegs. (Plate VII, fig. 3.) The larva, on hatching, eats into the pod and feeds upon the seeds ; or it bites into the unopened flower-bud and attacks the developing anthers. It never actually goes completely into the pod but stretches in from outside. This caterpillar is much like that of *Sphenarches caffer* and is found abundantly with it upon the buds and pods of pigeon-pea in the cold weather. The larval life lasts for 16 to 21 days in warm weather, from 25 to 30 days in the cold weather.

Pupa. Pupation takes place on the plant, openly. The manner of pupation is the same as that of *Sphenarches caffer*, and the pupa is similarly attached at two points to the silken pod by means of circinate spines forming two cremastral pads, one at the anal extremity and the other on the lower surface of the eighth abdominal segment. It is green, grey, or brown, and is, like the larva, cryptically coloured. The pupal period is from three to five days in the hot weather, seven days in the cold weather. (Plate VII, fig. 5.) Emergence from the pupa is effected by the rupture of the pupal integument along the median line from the vertex to the end of the midventral line of the thorax.

The moth is shown in Plate VII, fig. 6 ; the wings are normally held so that only the narrow forewing is visible. It is found flying in the dusk, resting by day on the lower surface of a leaf or on any convenient surface. Mating may take place soon after emergence, and oviposition the next night ; even in captivity without food the moths survive for ten days. In the insectary one moth laid a total of 94 fertile eggs, laying over thirty the first night, the remainder on four subsequent nights.

The following tables give normal life-histories in March-April ; the periods are longer in December-January as stated above :—

Eggs laid	Eggs hatched	Larvæ pupated	Moths emerged	Total
23–III	27–III	14 to 17–IV	19 to 22–IV	27—30
24–III	28–III	16–IV	21–IV	28
25–III	29–III	14–IV	17 to 19–IV	23—25

Occurrence. In the life-history as detailed above, there is no stage in which long periods of rest would appear to be undergone and hibernation or any such resting stage would seem to be impossible. Yet such resting periods must occur in actual fact ; the normal foodplant of this insect is the pigeon-pea (*Cajanus indicus*, known as *arhar*, *tur* or red gram) which is sown with the monsoon, say in July, and which flowers and bears pods in December-January in some parts of India, in March-April in others. There is thus abundant food for some months only, while this crop is coming into flower and pod, and it is then that it is found in abundance in all stages. The pest has been under fairly close observation in several places and there is a long gap between the crops of pigeon-pea which is apparently bridged in one of several ways. The leguminous plant *kulthi* or lablab bean (*Dolichos lablab*) is an alternative foodplant found in the rains before the pigeon-pea is producing flower-buds, and to a very small extent this insect has been found breeding on this plant. This has not been recorded in Pusa and the only known way in which the moth is known to live over in Pusa from April to December is as an imago in shelter in thick grass. A considerable amount of attention has been paid to the fauna of thick grass and this species has been found occasionally during the months when it is known to breed. It has been found only in this way during this time and only in small numbers in the moth stage.

We believe that normally it lives over from April to December as a moth in hiding, emerging when the pigeon-pea is coming into bud to breed ; in localities where there is a constant supply of its alternative foodplant, it emerges earlier and breeds in small numbers on this. That is, in some localities where *kulthi* is regularly grown, a summer brood is found on it ; in other places it is not. We may contrast this with *Sphenarches caffer* which has these two foodplants, but also breeds on Cucurbitaceæ, which are freely cultivated from April to December, so that the latter can find foodplants throughout the year. It is possible that *Exelastis atomosa* has wild alternative foodplants, but there is as yet no evidence to support this and, had they occurred in Pusa, we believe they would have been found.

PTEROPHORUS LIENIGIANUS, ZELL.

Pterophorus lienigianus, Zeller, Linn. Ent., VI, 380 (1852)(1); South Entom., XV, 105, t. 2 f. 3(2); Meyr., Handb., p. 439(3), T. E. S., 1907, 497(1908) (4); Fletcher, Spol. Zeylan., VI, 34-35 (1909)(5), S. Ind. Ins., p. 445, f. 322 (1914)(6), Proc. Second Entl. Meeting, p. 288 (1917)(7).

Leioptilus serindibanus, Moore, Lep. Ceylon, III, 527, t. 209 f. 14(8).

This species, originally described from Central Europe(1), occurs throughout India, Burma and Ceylon. We have specimens from Anuradhapura, Coimbatore, Godavari District, Peshawar, Pusa, Shillong, and Maymyo.

In Europe the larva has been recorded as feeding on the terminal leaves of *Artemisia vulgaris* and has been described as "pale bluish-green; dorsal line broad, darker; sub-dorsal yellow-whitish; head brown, blackish-marked" (3).

In India the larva feeds on brinjal (*Solanum melongena*) and has been described as "about 8 to 10 mm. long, moderately stout, hairy, very pale yellowish, head brown"(6). It has also been reared at Pusa from larvæ found on 26th March 1917 rolling and feeding on leaves of an unidentified weed locally called *khagra* (Pusa Insectary Cage-slip 1538).

PTEROPHORUS MONODACTYLUS, LINN

Alucita monodactyla, Linn., Syst. Nat. (ed. X) I, 542 (1758)(1).

Pterophorus pterodactylus, Buckler, Larvæ Brit. Butt. Moths, p. 365 (1901)(2).

This species is very widely distributed throughout Europe and North America, and occurs in the North-West Frontier Province and in Kashmir. We have specimens from Parachinar (Kurram Valley).

The larva feeds on various species of *Convolvulus*, *Chenopodium* and *Atriplex* and has been described by Porritt(2) as about 15 mm. in length and stout in proportion, head polished and rather small, body uniform and cylindrical, tapering a little posteriorly, segmental divisions well defined and deeply cut ventrally, each tubercle emitting a tuft of short but rather strong hairs; ground-colour bright yellowish-green, more decidedly green dorsally; head pale yellow, mandibles light brown; dorsal stripe narrow but distinct, yellowish white; a much broader yellowish-white spiracular stripe, the space between this and spiracles freckled with streaks and spots of the same colour; spiracles black, hairs greyish; ventral surface, legs and prolegs uniformly pale green.

PSELNOPHORUS ALBITARSELLUS, WLSM.

Alucita albitarsella, Wlsm., in Swinh., Cat. Lep. Het. Oxford Mus., II, 542 (1900).

This species was described from a single specimen from Ootacamund. I have examined this (type) specimen in the Oxford Museum and make it to be a *Pselnophorus* and not an *Alucita*. We have a specimen from the Palni Hills.

"Larva white, about half an inch long, with a few long hairs scattered about its body. It burrows into the shoots of a common jungle plant. Pupa suspended by tail from underside of a leaf (*Minchin*)".

ALUCITA NIVEODACTYLA, PAG.

Alucita niveodactyla, Pag., Zoologica, XXIX, 240 (1900)(1); Meyr., T. E. S., 1907, 490 (1908)(2); Fletcher, Spol. Zeylan, VI, 36, t. F f. 9 (1909)(3); Poulton, Proc. Ent. Soc. Lond., 1909, p. 39(4).

Aciptilia nivea, Snell., Tijds. voor Ent., XLVI, 56, t. 5 f. 17(5).

This species is widely distributed and is recorded from the Bismarck Archipelago(1), Java(5), Cochin China(4), the Philippines(2) and Ceylon(3). In India and Ceylon it is apparently confined to the Hill districts. We have it from Shillong and Cherrapunji.

"The larva feeds on the young leaves of an *Ipomœa*, eating the leaves from the outside and not entering within the unexpanded leaf in the manner of *Steganodactyla concursa*. In colour it is of a uniform pale yellowish-green thickly studded with long fasciculated tufts of whitish hairs, of which those of the dorsal row are the longest and sometimes tipped with brown. These hair-tufts are extremely complicated, and their appearance will be best understood from the rough sketch of a larval segment (Plate F, fig. 9); under the microscope these tufts of long hairs recall the armature of spines exhibited by an Echinid"(3).

"The pupa is green, thickly covered with pale green spinous hairs and with an interrupted dorsal and sub-dorsal row of black spots. The moth emerges after about a week"(3).

STEGANODACTYLA CONCURSA, WLSM.

Steganodactyla concursa, Wlsm., Ent. Mo. Mag. 1891, 241(1), Novit. Lepidopt. t. 12 f. 3(2); Fletcher, Spol. Zeyl., VI, 9, t. E ff. 1-2 (1909)(3).

This species is widely distributed in Ceylon and has been found in India at Belgaum and in Coorg. It has also been recorded from Sumatra by Hering (*Stett. Ent. Zeit.*, 1903, 96).

"The larva feeds between the young unexpanded leaves of a common climbing *Argyreia* and also of *Ipomœa populifolia*, eating the upper cuticular surface of the leaf into tell-tale patches.

"The full-grown larva may be described as stout, rather flattened; head pale yellow; other segments a pale greyish-green, interstices of segments (only visible when expanded) darker green; dorsal surface pale; warts with a little orange-yellow about their bases, often forming a distinct orange-yellow or reddish median stripe; an ill-defined broad dark lateral shade appears to be caused by the contents of the alimentary canal, as it disappears towards the anal extremity when frass is voided; hairs white, usually very conspicuous.

"In confinement the larva generally wanders off the foodplant to pupate but occasionally attaches itself to the upper surface of the midrib of a leaf. I have never found the pupa in nature.

"The pupa is usually suspended horizontally to a vertical support, being closely adpressed ventrally to the resting-surface by the double set of cremastral hooks. Its colour, which is variable, is some shade of pale green, but it always has a broad reddish medio-dorsal stripe. These colours fade into a greenish-brown shortly before emergence, which takes place after about six days, the moth generally appearing in the late evening, quite contrary to the usual habits of plume-moths. The pupa is comparatively extremely small, and it seems marvellous how such a large moth can emerge from a pupa-case which does not seem sufficiently large to contain its abdomen alone"(3).

Mr. Senior-White has also reared this species at Matale from *Lantana*, which is an unexpected foodplant.

AGDISTIS TAMARICIS, ZELL.

Adactyla tamaricis, Zeller, Isis, 1847, 899(1).

Agdistis tamaricis, Zeller, Linn. Ent., VI, 325(2); Milliere, Icon., III, 237, t. 126 ff. 5-7(3); Hofmann, Deut. Pteroph., p. 56(4); Wlsm., Entom. Rec., XIX, 54-55 (1907)(5).

Herbertia tamaricis, Tutt, Brit. Lep., V, 127-132 (1907)(6).

This is a widely-distributed species known from Europe(1), Cape de Verdes Islands(5), West Africa(5), Algeria(5), Cape Colony(5), Egypt, Arabia(5), and Karachi(5). We have a specimen, apparently of this species, from Peshawar.

The larva is described by Chapman(6). It feeds on *Tamarix*, but has not been found in India as yet.

This species may be looked for in all sandy areas where *Tamarix* grows commonly.